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ABSTRACT

This document examines the design and structure of PMIS (Planning and Management Information System), an information system that supports the decisionmaking process of executive management in local school districts. The system is designed around a comprehensive, longitudinal, and interrelated data base. It utilizes a powerful real-time, interactive data management system for strategic planning; evaluation studies; and local, State, and federal reporting. Following an introduction to PMIS in chapter one, the next four chapters examine the various compponents of the system. System components discussed are (1) the overall structure of the data base, its size, and its significance; the components of the support and information systems; and the operation of a PMIS system, the computer requirements, and first year system costs. The final chapter of the document discusses the future of PMIS activities. A related document is ED 063 647. (Author/DN)

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PMIS Project

Planning & Management Information System

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Final Report, Year 2

The Council of the Great City Schools
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PMIS Project

Planning & Management Information System

A Project to Develop a Data Processing System for Support of the Planning and Management Needs of Local School Districts

PMIS: FINAL REPORT, YEAR 2

Work Performed in Compliance With
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June 30, 1973

The Council of the Great City Schools

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The Council of the Great City Schools is a coalition of 24 of the largest urban school districts in the United States, organized to study, develop, implement and evaluate programs designed to promote educational reforms that will insure quality and equality of educational opportunities.

The Council Board of Directors consists of the Superintendent of Schools and one Board of Education member from each of the member cities. Representing a combined total school population of almost five million children from the 24 member cities, the 48 voting members of the Board of Directors can move decisively on problems which directly affect the achievement of educational excellence in urban areas.

The Council provides an effective mechanism for the dissemination of information and the exchange of ideas and insights among the large urban centers and is able to coordinate research and demonstration activities. The member city school districts provide a laboratory for experimental and developmental work in undertaking innovative and imaginative approaches in the search for ways and means to improve the education of inner city children.

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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Chapter 1

INTRODUCTION

1.1 PROJECT BACKGROUND

The Planning Management Information System (PMIS) provides information to the top management team of large school systems. The type of information avilable and the manner in which it is presented to the managers is largely controlled by the managers themselves. Most of the information PMIS generates deals with the planning and evaluation of the districts operations. However, the system has the capability to produce more than just these types of information.

The system's concept is straightforward. From the large amount of data maintained in a school district PMIS extracts those pieces of data that may be used by top management. These data are then stored in a large data base. A variety of retrieval techniques are then made available for converting the raw data stored in the data base into meaningful information.

The system was developed under a U.S. Office of Education (USOE) contract by the Council of the Great City Schools. The Dallas Independent School District (DISD), one of the Council member districts was the pilot site for actual system development and contributed heavily to the developmental effort. Work began in October 1970, the system became operational in May 1973. It is the goal of Council to develop versions of the pilot system in any of its member districts that express a desire for such a system.

1.2 PMIS DESIGN PREMISES

The PMIS design is a direct outgrowth of the following system and user premises:

- Source Data Gathering - PMIS has always had as a constraint that it would not require additional data, over and above that contained in existing files, be gathered for its initial operation. Many Council cities face continuous financial crisis and cannot be expected to undertake expensive data collection efforts. Fortunately, most districts already have a large amount of data available. The pilot PMIS system is designed to make effective use of this data for planning and policy making purposes without imposing new data collection efforts.

  However, to be entirely constrained by the limitations of existing data would not advance the educational planning and policy making capability. Therefore an essential component of the design is a statement of the data requirements for more effective planning, and a precise definition of the gap between available data and needed data.

- Individual Unit Distinction - With few exceptions, users will not deal with one individual, e.g., a student, a staff member, one school facility, etc. Rather, they will be more concerned with district wide problems. However, since these types of problems are seldom well defined or specific, it is near impossible to predict in advance which groupings or summaries of individual units may be needed. Therefore, the PMIS data bases were designed to allow access down to the individual unit level to accommodate this contingency.

- Total System Security - PMIS had to be designed to service many users. Included in this group of users are the Board of Education, Superintendent, and the Superintendent's executive team. This called for centralizing the storage of large amounts of sensitive data. Provisions thus had to be made for maintaining tight control over such an environment.

  To meet this need, a separate routine was developed as a part of the internal control subsystem to internally control all user requests for data. This routine employs an external-internal password process, as well as other controls, to prevent unauthorized system entry and to maintain security over the PMIS data bases.

- Ad Hoc Management Support - Top educational executives, who formulate district-wide plans and policy, have an overwhelming need for data to help solve the many complex and interrelated problems they face. They must be furnished all

the information they need in a timely and responsive manner, and in the sequence and format that best suits their purposes. PMIS has been designed to fulfill these difficult requirements.

A large and comprehensive data base is provided as a separate, major system component. As such, it can be expanded at will to accommodate diverse and growing educational data needs. Remote inquiry capability is provided to link top management to the PMIS data bases for quick and effective response. An executive or one of his aides can, at a moments notice, query the data base and receive replies in several minutes or at most, a few hours.

In addition, information needs can be filled in a variety of ways. Users may ask a single question or a series of questions, either of which provide the answers they seek. However, the initial query may provide just enough information to stimulate additional questions for the purpose of zeroing in and shedding more light on the particular problem at hand. In this respect, there are no restrictions regarding the number of times a user may successively query the data base. A different approach relies on using the existing standard reports, contained in the PMIS Reports Library, to provide the requested information. When convenient, the user can (with automated assistance) browse through the reports library and choose such a report. Also, means are provided for the user to have additional data incorporated into the report before it is produced.

- Planning Process Support - During the course of the design work it became clear that planners require large amounts of data and sophisticated retrieval and computational tools to transform this data into meaningful planning information. Since the entire formal planning process is still being evolved at the pilot site, and since this evolution will continue over the next few years, it is imperative that PMIS support planning be flexible. Therefore, rather than try to immediately develop a rigid system to support planners, or to develop a huge computer model that would cover all steps of DISD's planning process, a different approach was used.

- A number of easily used tools were developed. These include computer models which simulate certain steps of the planning process, a library of evaluation reports, and an ad hoc query capability. The planners are free to select the most suitable tool for any one step of the planning process.

- System Improvement and Expansion - PMIS, as developed during the first two years, should be considered a foundation system; additional refinements and enhancements will occur as planners and policy-makers begin to place demands upon it for the

support they need. In addition, educational planning will always be undergoing substantial development, requiring that new data and supporting models be incorporated into the PMIS structure in order to keep pace. For these reasons, PMIS has been designed with the "change factor" in mind. The harmonious blend of independent, expandable data bases, self contained data management software, and modular supporting subsystems, permits rapid and easy change to the system.

- Utilization of Existing Software - It was realized early that tailoring the system requirements around a commercially available data management package would facilitate a rapid and cost effective development process. Thus, this consideration was adhered to during the initial design phase. However, it was not allowed to become a rigid constraint or to interfere with the original purposes and goals of PMIS. The rule of thumb that applied throughout was to first define what PMIS was to do, and then employ those definitions to effectively measure and select the most appropriate software to handle the job.

The end result of these factors is a system design that effectively provides a wide variety of information, under varying conditions, to many users. At the same time, as greater demands are placed upon the system, it can be easily modified and expanded.

1.3 PMIS DESIGN OVERVIEW

As can be seen in Figure 1.1, PMIS consists of two major components, the Support System (SS) and the Information System (IS). The SS component is centered around the PMIS data base. It acquires data for the data base, creates, maintains and monitors the status of the data base, maintains security over the data, and provides the tools for retrieving data from the data base. The IS component consists of four subsystems each corresponding to a specific management function. The subsystems were initially identified by USOE, DISD and Council personnel. The current system is in keeping with the initial proposal submitted to the USOE.

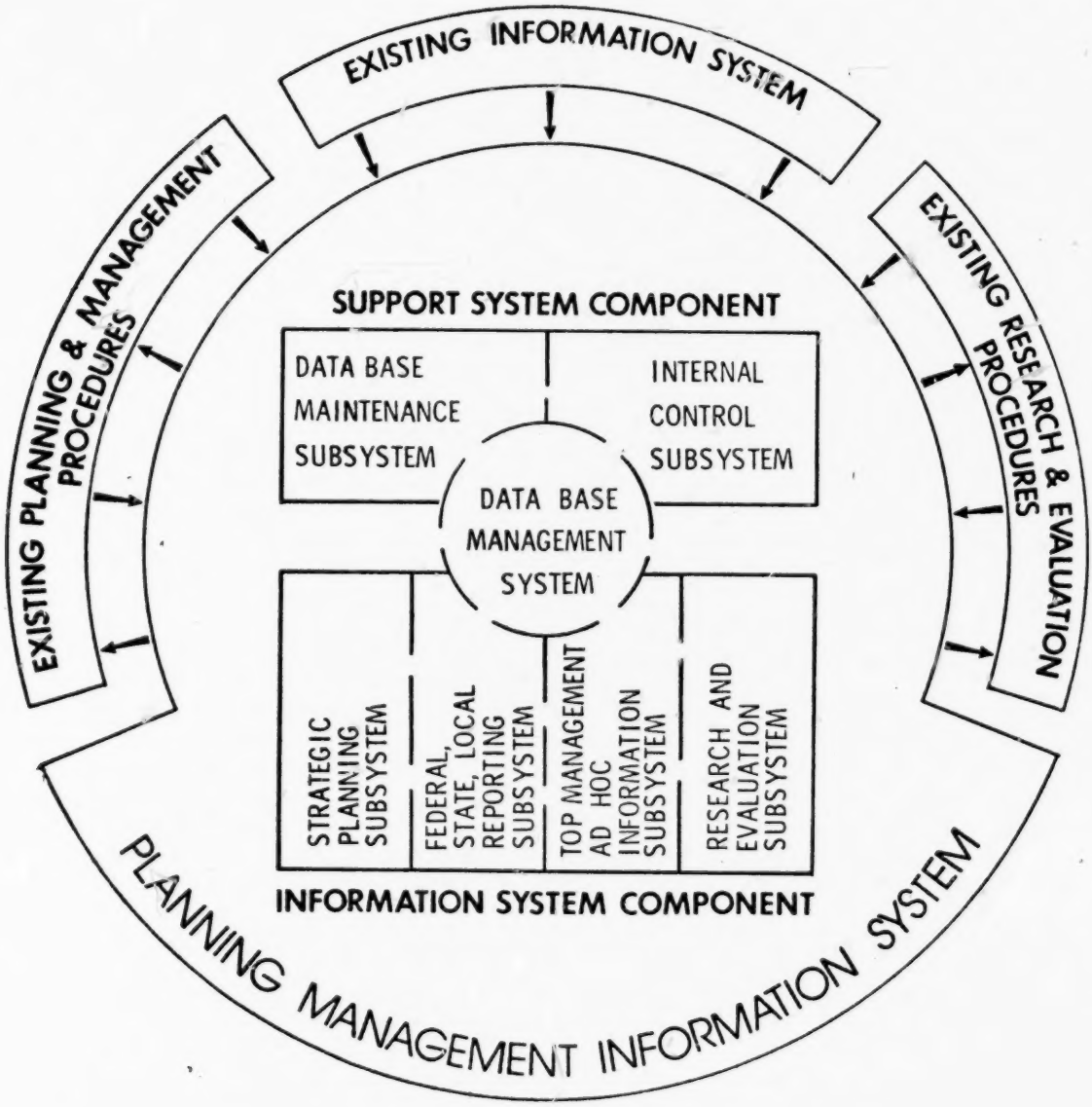
EXISTING INFORMATION SYSTEM
EXISTING PLANNING & MANAGEMENT PROCEDURES
EXISTING RESEARCH & EVALUATION PROCEDURES
SUPPORT SYSTEM COMPONENT
DATA BASE MAINTENANCE SUBSYSTEM
INTERNAL CONTROL SUBSYSTEM
DATA BASE MANAGEMENT SYSTEM
STRATEGIC PLANNING SUBSYSTEM
FEDERAL, STATE, LOCAL REPORTING SUBSYSTEM
TOP MANAGEMENT AD HOC INFORMATION SUBSYSTEM
RESEARCH AND EVALUATION SUBSYSTEM
INFORMATION SYSTEM COMPONENT
PLANNING MANAGEMENT INFORMATION SYSTEM

FIGURE 1.1

The two components are complementary, yet function quite differently. The Support System is a large repository of data which is supplied on demand to the Information System. The SS is a stable system resource which changes only when new data is added to the repository, and even this change will usually be quite small. However, the IS is dynamic, constantly growing or changing as managers require greater amounts and different kinds of PMIS information. When new needs arise, the necessary computer programs can be written and stored in the IS program library. These new programs will call for data from the SS, which is designed to respond accordingly.

Most of the work performed by these two components involves data handling operations that can be executed by commercially available software. After careful analysis, SYSTEM 2000, marketed by MRI Systems Corporation of Austin, Texas, was selected as the package best meeting the defined needs of these two components. All PMIS computer programs utilize the features of SYSTEM 2000 whenever data management operations are to be performed.

1.4 PMIS "THE MISSING LINK"

The public's demand for improved education has led to revised methods in school management requiring new tools such as personnel simulation models, cost-ed models, cost/benefit and effectiveness analysis, etc. All of these are, or will be, altering the face of American education.

These new requirements result in disciplines that share one common property -- they demand enormous amounts of accurate data. Until the advent of PMIS each discipline evolved independently. The result

was a proliferation of data files, most of which were not interrelated or consistent.

PMIS will hopefully bring an end to this condition. As a manager of data, PMIS will unify, purify, and maintain control over the data acquisition and storage process. As a support tool, it cuts across all of the management disciplines, hastening their integration. The logical structure of PMIS tends to clarify where the development of new management disciplines fits within the total management process.

In short PMIS is the missing link, the vital bridge, between the education community's desire for improved management, and the current situation. Without it, the large data demands of these new disciplines cannot be met, nor can a logical, well ordered development process be undertaken, unless inordinate amounts of time and resources are expended.

Chapter 2

THE PMIS DATA BASE

2.1 OVERALL STRUCTURE

The heart of PMIS is its comprehensive, interrelated and longitudinal set of data bases. The organization and content of the data bases largely determine what information can be generated by the system. The following is a brief description of the data bases.

The data contained in PMIS is organized into three data bases. As seen in Figure 2.1, the STUDENT I data base contains data about the students that are currently enrolled in the school district; the STUDENT II data base contains data about the students that have left the school district for any reason; and the STUDENT SUPPORT data base contains administrative and educational data about the district support provided to students, input/output data used in various runs of the strategic planning models, and data about the maintenance and operation of PMIS itself.

Each data base consists of logical groupings of data called trees. Each tree, in turn, consists of logical sub-groupings of data called repeating groups. Each repeating group consists of components. The first component in each repeating group is the *repeating-group* component. It does not contain data. It defines the structural organization of the data that is contained within the data base. The other type of component in the repeating group is the *data element* component. It contains data. The purpose of a repeating group is to allow for multiple occurrences of related elements, e.g., individual course information within a directory of courses, or individual student

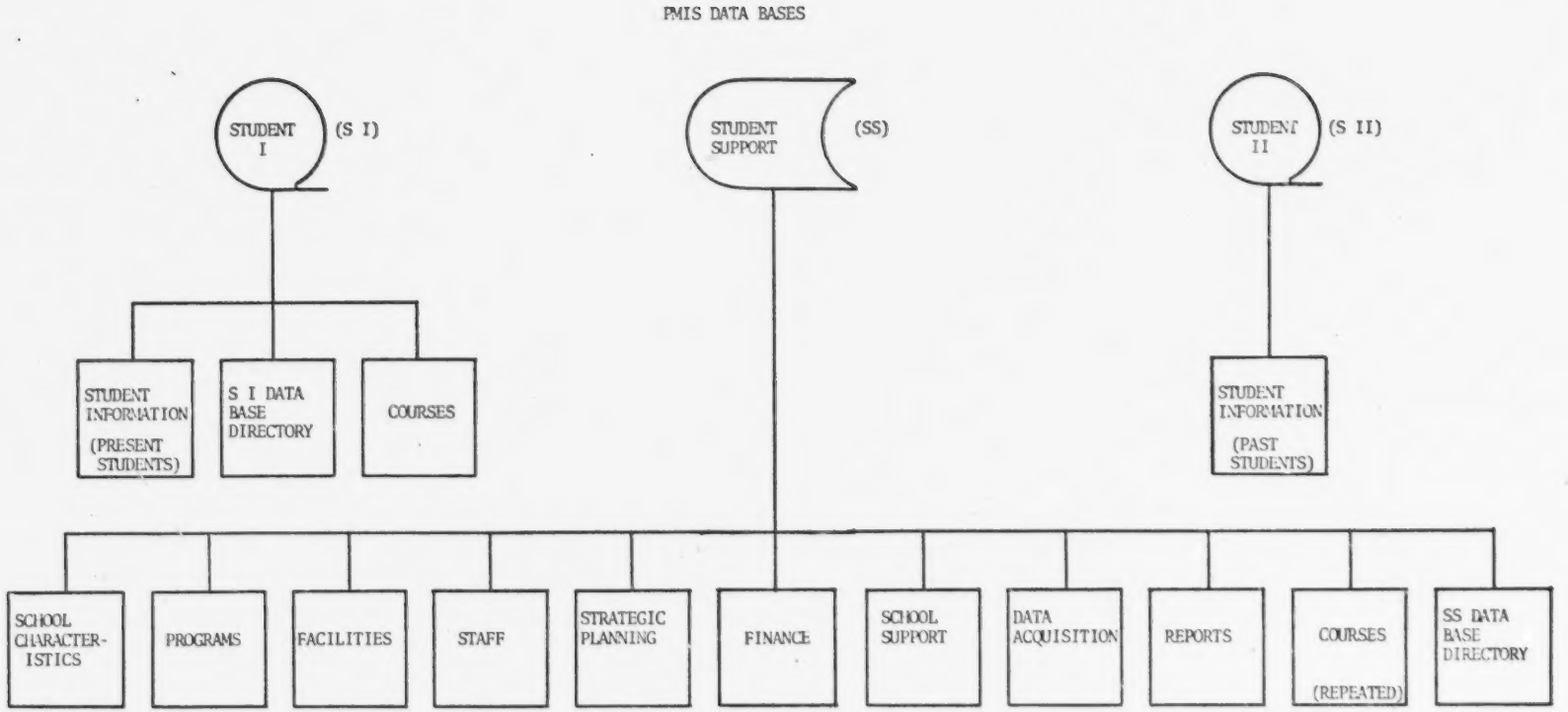
PMIS DATA BASES
STUDENT I
(S I)
STUDENT SUPPORT
(SS)
STUDENT II
(S II)
STUDENT INFORMATION (PRESENT STUDENTS)
S I DATA BASE DIRECTORY
COURSES
STUDENT INFORMATION (PAST STUDENTS)
SCHOOL CHARACTER-ISTICS
PROGRAMS
FACILITIES
STAFF
STRATEGIC PLANNING
FINANCE
SCHOOL SUPPORT
DATA ACQUISITION
REPORTS
COURSES (REPEATED)
SS DATA BASE DIRECTORY

FIGURE 2.1

educational records within a data base for all students.

Repeating groups may also be defined as belonging to another repeating group. This capability allows a user to define a hierarchical structure. This nesting capability enables, for example, a data base to contain a repeating group of course information to exist within the student's total educational records. In short, a data base may contain multiple trees, and each tree may contain multiple repeating groups, some of which are nested hierarchically and others which are not. Figure 2.2 serves to illustrate these structural capabilities.

2.2 THE STUDENT I DATA BASE

The STUDENT I data base is designed to contain three distinct data trees. The STUDENT INFORMATION tree consists of basic biographis data, context data, educational assessment data, and student achievement data for each student currently enrolled in the school district. The biographic data includes the student's unique identifier, his name, birth date, etc. The student's context data serves to locate the student in his environment. It includes the student's vocational aspirations; his family's education, socio-economic status, primary language at home, and occupational information for the head-of-household; and finally data concerning the student's physical and emotional handicaps. The student's educational assessment data includes the results of standardized tests, and the results of other student assessment services that may be provided by the school district. the student's achievement data includes for each year in attendance at the school district, his grade, school attended, cumulative grade point average, and information about each activity or course undertaken by the student.

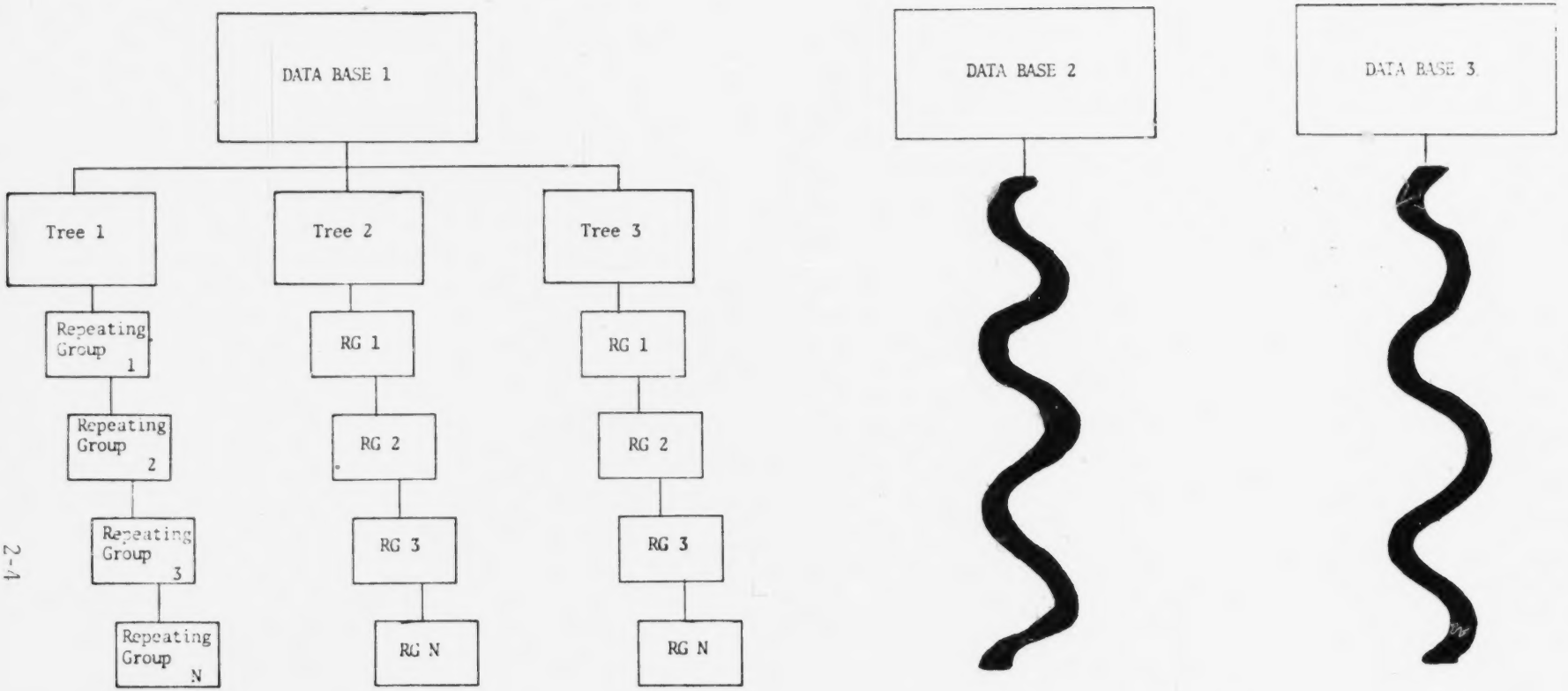
DATA BASE 1
Tree 1
Tree 2
Tree 3
Repeating Group 1
Repeating Group 2
Repeating Group 3
Repeating Group N
RG 1
RG 2
RG 3
RG N
RG 1
RG 2
RG 3
RG N
DATA BASE 2
DATA BASE 3

FIGURE 2.2

The DATA BASE DIRECTORY tree consists of data that describes the elements that are in the STUDENT INFORMATION tree. This descriptive data includes an explanation of any codes associated with an element, a definition of the primary source of data for an element, and a listing of the PMIS reports that utilize this element.

The COURSES tree contains data that approximates the content of the district's master schedule. In the COURSES tree are the course-selection-numbers, the school identification numbers, the grade-achievement level of the course, and the educational program to which the course belongs.

2.3 THE STUDENT II DATA BASE

The STUDENT II data base is designed to contain data similar to that contained in STUDENT I. In addition to the student information that is transferred from the STUDENT I, there is follow-up information that is collected at one, three and five year intervals for those students that have graduated or dropped out.

2.4 THE STUDENT SUPPORT DATA BASE

The STUDENT SUPPORT data base contains eleven distinct data trees. The trees are: SCHOOL-CHARACTERISTICS, PROGRAMS, FACILITIES, STAFF, STRATEGIC PLANNING, FINANCE, SCHOOL SUPPORT, DATA ACQUISITION, REPORTS, DATA BASE DIRECTORY and COURSES. This data base is designed to contain historical data in the first seven trees.

The SCHOOL CHARACTERISTICS tree is designed to contain data about each school in the district. Included in this school data is the school identification information, data relating to follow-up assessments on students that have left the school, data describing local community programs that operate out of the school, and data

concerning the educational assessments of children by target groups within ethnic group within grade. The target groups of children defined by the user might be the disadvantaged, the low income, the handicapped, the migrant, the gifted, the potential drop outs, or any other group that has a distinguishable educational characteristic.

The PROGRAMS tree of the STUDENT SUPPORT data base is designed to present a view of students and their assessments from within the programs and courses in which they are enrolled. This differs from the SCHOOL CHARACTERISTICS tree where the view of the students is from grades within schools. In addition to the view of students and their assessments the PROGRAMS tree is designed to contain data relating to program costs for each school site in which the program is operating, data that describes the various instructional methods employed in the program, and finally, data to identify the agency that supports the program including the percentage of program costs supported by the agency.

The FACILITIES tree of the STUDENT SUPPORT data base contains data relating to the nature and purpose of all buildings in the school district. Included is descriptive data such as the building's name, owner, address, function, year completed, size, whether or not the -uilding conforms to the building code, and historical data about additions. Data is also included that describes the various functional areas and classrooms contained in the building.

The STAFF tree of the STUDENT SUPPORT data base is designed to contain data about all staff members in the school district. The biographic data for each staff member includes the employee's name, ethnic type, birth date, professional and marital status, and, where

appropriate, the termination code and date. Inlcuded also is data describing the staff member's educational background, including degrees, year achieved, major, and institution attended. For certified staff members there is also included data on the types of certification awarded. The final type of data in the STAFF tree describes the employee's history, i.e., his job code, major duty, evaluation rating, assigned courses or programs, and the type, length and nature of any in-service educational experiences.

The STRATEGIC PLANNING tree of the STUDENT SUPPORT data base contains data that described the characteristics of the projects included in the PMIS planning models. In general, the data describes each planned project's name, fixed and variable costs, minimum and maximum students, the project's duration, related educational courses that might make up the project, and budgetary projections for five years.

The FINANCE tree of the STUDENT SUPPORT data base contains budget and expense information identified by function, object, subject-object code, source of fund and location.

The SCHOOL SUPPORT tree of the STUDENT SUPPORT data base is designed to contain two types of data pertaining to the school district in general. The first kind of data concerns school district support revenues. There is for each revenue source, the dollar receipts, the source of the funds, the fund use restriction codes, and an enumeration of the educational programs that receive benefit from the funds. The second type of data in this tree concerns the population characteristics of the school district's community. For each ethnic type in the community there is data on its unemployment rate, housing characteristics, and other socio-economic factors of that population sub-group.

The remaining four data trees of the STUDENT SUPPORT data base contain data in support of the production and maintenance of PMIS itself. The DATA ACQUISITION tree contains data that is contained in the STUDENT I, the STUDENT II, and the STUDENT SUPPORT data base trees. The REPORTS tree contains data that describes each report produced by PMIS. Included in this reports-data is the report number, title, key-word descriptors, production information and distribution lists. The DATA BASE DIRECTORY tree contains the data that describes the elements that are in each of the other trees in the STUDENT SUPPORT data base. This descriptive data includes an explanation of any codes that might be associated with an element, and a listing of the PMIS reports that utilize the data contained in an element. The final tree in the STUDENT SUPPORT data base is the COURSES tree. It contains data that approximates the content of a master schedule. This data is needed for use in the PROGRAMS tree and the STAFF tree. The data consists of course-section-numbers, the school identification numbers, the grade-achievement level of the courses, and the educational program to which courses belong.

2.5 DATA BASE SIZE

The size of the data base is determined by the following variables.

- The number of logical entries in each tree. A logical entry is analogous to a record in conventional data processing systems. One student, one facilities, or one program are examples of one logical entry.
- The number of data elements within each logical entry that are valued i.e., loaded with data. It must be remembered that certain data elements within a logical entry may not be loaded with data. For example, if a student is not handicapped this data element in the STUDENT I data base is not valued. Non-valued data elements do not require any storage space.

- The number of year of data in the data base. All data bases are longitudinal. Since most districts will not collect historical data in creating the data base, the data base will be much smaller in Year 1 than in Year 5 or Year 13.

- The number of data elements designated as "key" elements. Key elements are inverted and hence require that SYSTEM 2000 store their pointer values in work tables.

Since districts are of different sizes, (have different amounts of logical entries), have different numbers of data elements that can be valued at the time of system start up, and may demand the different elements be designated as key, there does not exist any simple means for estimating data base size. Each district must be studied individually.

Furthermore, the importance of data base size depends on the data base's storage medium. There is less concern over the amount of data stored on tape than on disc. In PMIS STUDENT I and STUDENT II are designed for tape storage. STUDENT SUPPORT is designed for disc storage. Therefore, when discussing data base size, the size of the STUDENT SUPPORT data base is of most concern.

The pilot site is a district of 160,000 students, 11,000 staff members, 180 schools and approximately 100 programs. In year 1 the STUDENT I data base will require 100 million characters of storage, STUDENT II will require 10 million characters of storage and STUDENT SUPPORT will require 50 million characters of storage. Current estimates are that STUDENT I will grow at the rate of 25 million characters a year, STUDENT II will grow at the rate of 10 million characters a year, and STUDENT SUPPORT will grow at the rate of 25 million characters a year. In subsequent reports Council will publish formulae for computing data base size.

2.6 SIGNIFICANCE OF THE PMIS DATA BASE

One major goal of PMIS is to create and maintain a comprehensive, interrelated and longitudinal set of data bases. This is a major undertaking. It requires determining what data is needed by top management; searching for sources of this data; capturing this data and storing it in the data bases provided that it is accurate, timely and consistent; and managing the data once it is in the data base. The ability of PMIS to generate information for management use is directly governed by how well the data base creation and maintenance process is executed.

Chapter 3

SUPPORT SYSTEM COMPONENT

3.1 GENERAL

The function of the SS component is to construct, maintain and retrieve data from the PMIS data base and to provide absolute control over the entire process. To accomplish this two subsystems, Data Base Maintenance and Internal Control, have been developed. The Data Base Maintenance subsystem consists of eleven data acquisition modules and eight data base handling modules. The Internal Control subsystem contains fifty-nine control modules. A module can vary in complexity from one SYSTEM 2000 command to a series of large computer programs.

3.2 DATA BASE MAINTENANCE SUBSYSTEM

The Data Base Maintenance Subsystem's eleven modules create and maintain Student I and Student II and seven of the ten trees in Student Support. Four modules capture data from DISD's student master record file, standardized test file, master schedule file and facilities data file. Each of these modules perform vigorous edit and logic checks on the source data before entering the data into the data base. These four modules largely maintain Student I and completely maintain the facilities tree of Student Support. Two other modules capture data from external sources to maintain the Staff and Strategic Planning tree of Student Support. Both of these modules also contain a battery of edit and logic checks. Four other modules transfer or summarize data already entered into the data base by the preceeding six modules into other parts of the data base. The last module maintains Student II.

The eight data handling modules utilize SYSTEM 2000 commands during actual job execution. Various modules move the data base from tape to disk or vice-versa, activate and deactivate various files used for archival purposes, and physically redefine the data base where necessary. These modules are used singly and in combination whenever any PMIS run occurs.

3.3 INTERNAL CONTROL SUBSYSTEM

The Internal Control Subsystem consists of fifty-nine separate modules. Twenty-four of the modules maintain data in the Data Acquisition, Reports, and Data Base Directory trees of Student Support. These modules are called into use whenever (1) reports are added or deleted from the system, (2) a change is made to a data acquisition module, (3) the results of a data acquisition run are known i.e. percent and quality of data successfully gained, and (4) data elements are added or deleted from the data base.

The remaining thirty-five modules print reports from the three trees cited above. The reports are primarily used by PMIS administrators for monitoring and controlling PMIS operations. These reports fall into three classes:

- Status - what reports are available, what data elements are currently contained in the data base, what is the quality of a given data element, etc.
- Scheduling - what reports are due on a given day, at the end of a semester, etc.; when is a data acquisition run scheduled, etc.
- Relationship Analysis - if a certain data element is deleted from the data base, what reports cannot be prepared; if a data acquisition run encountered a high reject rate what data elements and subsequently what reports are affected, etc.

Chapter 4

INFORMATION SYSTEM COMPONENT

4.1 GENERAL

The function of the IS component is to generate, upon request, the information required by management to make informed decisions. Information is generated in three different ways --by planning models, standard reports, and ad hoc queries. Any information ultimately appears on a report prepared either in hard copy form or displayed on a computer terminal. The difference in the three types of outputs stems from the generation technique. Planning models extract data from the data base and subject it to extensive mathematical computations and manipulations before any reports are prepared. Standard reports extract data from the data base, array it into a fixed format, calculate row and column totals, and perform very simple mathematical operations such as percentages before generating the report. The user has some ability to alter the content of a standard report by describing what data the report will span e.g., one school, schools within a subdistrict, all schools; but this capability is limited. Ad hoc queries are prepared on an as needed basis. Their content and format is determined by the situation at hand, and after they are executed they are discarded.

For design purposes the Information System Component has been organized into four subsystems. The Strategic Planning Subsystem contains the planning models. The Top Management Ad Hoc Subsystem embraces ad hoc report generation, which is almost entirely based on the capabilities of SYSTEM 2000. Standard Reports have been split into two subsystems -- the Research and Evaluation Subsystem will produce the complex reports needed by

this department, while the Federal, State and Local Reporting Subsystem generates specific reports for submission to these three segments of the education establishment.

During actual system usage the lines between these subsystems are unimportant. For example the planning process will be supported by three PMIS planning models, thirteen standard reports and an unknown number of ad hoc queries (to fill in information gaps). The significance of the subsystem designation is for design and documentation purposes only.

4.2 STRATEGIC PLANNING SUBSYSTEM

This subsystem contains three models at the present time. These models were developed in light of DISD's need for specific types of planning information and the resources available to develop planning models. More models will be developed as the data base content increases and as design resources become available.

Personnel Simulation Model (PERSIM)

PERSIM utilizes Markov chains to simulate the flow of teachers into, through and out of the school district. Its purpose is to provide a method by which the following decisions/evaluations can be made:

1. Forecast the status of the faculty flow system X number of years into the future. The stature can be described in terms of such variables as races, sex, teaching assignment, college preparation, and degree level.

2. Anticipate the hiring requirements for X number of years into the future by using the same variables as in "1" above.

3. Forecast salary costs for the school district for X number of years into the future. These salary costs can be broken down into various combinations of the variables used to describe teachers as in "1" above. Also, the effect of varying pay structures within the district can be accommodated.

4. Predict the effect of a set of policy and/or environmental changes upon the faculty flow for X number of years into the future. These "effects" will be measured in terms of cost levels and number of teachers within the desired selected categories.

PERSIM was developed by the Dallas Independent School District and is available to other districts for a nominal fee. Additional information on the model can be obtained by contacting Mr. Rogers Barton, Associate Superintendent for Planning Research and Evaluation, 3700 Ross Avenue, Dallas, Texas, 75204.

Selection Hierarchy Optimization Tool (SHOT) Model

SHOT is a linear programming model, developed by the PMIS design team, that is able to compute a series of optimum "mixes" of programs or projects (special programs). In the initial version of PMIS, SHOT will only be used to determine an optimum mix of projects, since the cost and desired achievement data required by the model is not available for district-wide programs. As district-wide data become available it can be fed into the model; no changes will need to be made to the model itself.

Each optimum set of projects maximize student performance within a district's budgetary and policy limitations. The optimum set of projects is designed to illuminate important questions concerning strategic planning:

- Where am I spending my dollars now?
- Are my dollars being spent on measurable accomplishments?
- How deficient are elementary students in reading skills?
- How many children are involved in special projects now?
- How many teachers are being used in special projects?
- How much does it cost to conduct projects X, Y, and Z?
- Is project X more effective than Y?
- Does project X cost more than Y?
- If project X is more effective and less expensive than Y, why are we involved in project Y at all?
- What would happen if we got rid of project Y and Z and expanded project X to 15 more schools?
- What if we expanded project X district-wide?

SHOT thus provides a way to correlate many of these questions so that managers are able to "see" into the future in order to determine whether or not their plans will "work". That is:

- Will these projects effectively raise achievement levels?
- Will the objectives and content of the project justify the cost?
- Is there an effective way to measure achievement so that we will know if we are making progress toward our objectives?

SHOT results will provide planners with a large pool of information which will help them construct their plans. It is anticipated that these results will be tempered by human judgment for various factors that are not considered by the SHOT model. SHOT does not replace human judgment -- rather it aids planners as they perform their complicated and very difficult tasks.

Budget Estimation Model (BEST)

BEST is a probalistic model that enables secondary school principals to more rapidly construct school schedules, estimate teacher requirements and prepare annual operating budgets. By decreasing the amount of time required to perform this work, the districts entire budget making process is significantly improved.

The information specifically meant for principals is described below.

- A chart telling the number of students requesting a course and the number of sections required at various class sizes. Data is given for the range of class sizes specified for that particular course, and the optimum size is used for cost estimates.
- A chart of actual class size (pupil/teacher ratios) centered around the optimum number of classes. This chart is meant to assist the principal in adjusting the schedule by one or two sections in particularly sensitive courses.

- A matrix showing students who have requested potentially concurrent courses. This conflict matrix allows the principal to avoid scheduling 1 and 2 section courses at the same time when students have requested both courses. This is a schedule building tool, not a budget tool.

Model Interaction

The three models compliment each other. For example, PERSIM helps management to estimate the district's operating budget. SHOT then helps management to determine how to allocate funds to projects within the operating budget. Conversely SHOT can be used to estimate how many students could be enrolled in certain programs if budget constraints were eased. PERSIM could then predict the impact of this change on hiring requirements. There are endless variations to this complimentary relationship.

4.3 TOP MANAGEMENT AD HOC INFORMATION SUBSYSTEM

This subsystem uses the English-like query language of SYSTEM 2000 to prepare reports either in response to crisis situations, or to fill in information gaps because of the unavailability of information from planning models or standard reports. The content of the reports is limited only by the availability of data in the data base. Therefore the usage of such reports depends on the creativity of the user, and users can be anyone in the district, or for that matter outside of the district, who has been granted access to the data base.

Usually an ad hoc query is destroyed after it is executed. However, when a user notes that he frequently requests the same ad hoc query, this query can be designated as a standard report and catalogued in the PMIS reports library. This eliminates the need to recode the

query every time it is executed. Council estimates that there could be as many as 200 standard reports generated in this fashion by 1975.

A simple, actual example of the uses of an ad hoc query appears in Tables 4.1 thru 4.4. The problem was to determine the effect on the racial balance of two schools, if grades one, two and three from school 163 were moved to school 162: Table 4.1 is a list of the needed ad hoc queries, each of which has been assigned a four digit identification number e.g., 4003. Tables 4.2, 4.3 and 4.4 then show how the queries were used, and the answers that were generated.

As can be seen the ad hoc query is a powerful and useful adjunct to the other output generation features.

```
        ACCESS:
        DESCRIBE STRINGS:
4003*   REDISTRIBUTE STUDENTS (STRING (CHANGE CURRENT-SCHOOL-CODE
                    EQ *2* WHERE CURRENT-SCHOOL-CODE ED *1* AND (GRAD
                                        EQ *3* OR GRADE-MODULE EQ *4* OR
        E-MODULE
          GRADE-MODULE EQ *5* ):))
4004*   SCHOOL TOTAL (STRING *LIST/TITLE SCHOOL TOTAL/
                    COUNT STUDENT-NUMBER WHERE CURRENT-SCHOOL-CODE EQ
          *1* OR                        CURRENT-SCHOOL-CODE EQ *2*:))
4005*   AVERAGE SCORE (STRING (LIST/TITLE AVG CTBS TEST SCORE/
                    AVG SUBTES-SCORE WHERE SUBTEST-NAME EQ *1* AND TE
        ST-NAME EQ *2*                  AND CURRENT-SCHOOL-CODE EQ *3*:)
        )
4006*   COUNT ABOVE AVG (STRING (PRING COUNT C52 WHERE C52 GT *1*
                    AND C49 EQ *2* AND C43 EQ *3* AND C166 EQ *4*:))
4007*   ABOVE AVG LIST (STRING (LIST/TITLE LAST NAME  ,FIRST NAME ,
                    SCORE/C94, C95, C52, ORDERED BY C52 WHERE C52 GT *1
        *                               AND C49 EQ *2* AND C43 EQ *3* AN
        D C166 EQ *4*:))
4008*   ED1 (STRING (LIST/TITLE ETHNIC COUNT++WHITE,  ETHNIC PCT/COUNT
        C4, (((COUNT  C4)/*3*)*100.00) WHERE C4 EQ 1 AND (C166 EQ *1* OR
        C166 EQ *2*):     LIST/TITLE  BLACK                    /COUNT C4,(
        ((COUNT C4)/*3*)*100.00) WHERE C4 EQ 2 AND (C166 EQ *1* OR C166
         EQ *2*):))
4009*   ED2 (STRING (LIST/TITLE MEX-AM      ,                  /COUNT C4, (((C
        OUNT C4)/*3*)*100.00) WHERE C4 EQ 3 AND (C166 EQ *1* OR C166 EQ
         *2*):   LIST/TITLE  INDIAN                        /COUNT C4, (((COUNT
        C4)/*3*)*100.00) WHERE C4 EQ 4 AND (C166 EQ *1* OR C166 EQ *2*
        ):))
4010*   ED3 (STRING (LIST/TITLE ORIENTAL     ,                /COUNT C4,(((C
        OUNT C4)/*3*)*100.00) WHERE C4 EQ 5 AND (C166 EQ *1* OR C166 EQ
         *2*):   LIST/TITLE OTHER        ,                /COUNT C4,(((COUNT
        C4)/*3*)*100.00) WHERE C4 EQ 6 AND (C166 EQ *1* OR C166 EQ *2*
        ):))
4011*   ETHNIC DISTRIBUTION (STRING (*ED1**ED2**ED3*))
4050*   STUD IN COURSE (STRING (LIST/TITLE STUDENT+LAST NAME    ,+FIRST
         NAME      ,ETHNIC+CODE,SEX  ,BIRTH+DATE/    C94,C95,C4,C5,C3,0
        B   C94,C95 WHERE C64 EQ 7172F AND C166 EQ *1* AND C71 EQ *2*:)
        0
```

TABLE 4.1

4) the following sequence of ad hoc commands is used to show a method for determining the effect on the racial balances of two schools is grades one, two and three from school 163 were moved to school 162.

a) The total number of students in i) school 162 and ii) school 163:

i)

```
                    *C4004(162,0)
          SCHOOL TOTAL
     ***
                     292
```

ii)

```
                    *C4004(163,0)
          SCHOOL TOTAL
     ***          923
```

b) The beginning ethnic distribution of i) school 162 and ii) school 163:

i)

```
                *C4011(162,0,292.00)
  ETHNIC COUNT    ETHNIC PCT
  WHITE
***
                240         82.192
  BLACK
***
                 28          9.589
  MEX-AM
***
                 17          5.822
  INDIAN
***
                  3          1.027
  ORIENTAL
***
                  1          0.342
  OTHER
***
                  2          0.685
```

TABLE 4.2

ii)

```
                    *C4011(163,0,923.00)
  ETHNIC COUNT    ETHNIC PCT

  WHITE
***
                4          0.433
  BLACK
***
              849         91.983
  MEX-AM
***
               63          6.826
  INDIAN
***
                2          0.217
```

c) Change all students in grades one, two, and three at school 163 to a "dummy" school 463.

```
                *C4003(163,463*,01,02,03)
-   325    SELECTED DATA SETS -
```

TABLE 4.3

d) The combined enrollment of school 162 and grades one, two, and three of school 163:

```
                    *C4004(463,162)
   SCHOOL TOTAL
***
                617
```

e) The ethnic distribution of the combined enrollment:

```
                *C4011(162,463,617.00)
  ETHNIC COUNT    ETHNIC PCT
***
          240        38.898
**
          323        52.350
**
           42         6.807
**
            5         0.810
**
            1         0.162
**
            2         0.324
```

f) Change all students from "dummy" school 463 back to their original school 163.

```
                *C4003(463,163*,01,02,03)
-    325   SELECTED DATA SETS -
```

TABLE 4.4

4.4 RESEARCH AND EVALUATION (R & E) SUBSYSTEM

This subsystem provides the data and retrieval capability needed by the Department for implementation of their master plan, "A Plan for Longitudinal and Cross Sectional System Wide Evaluation Program in Dallas." This plan laid down three goals of the R & E department:

1. To provide evaluation services to operational and support departments of the district as projects are planned and implemented.
2. To analyze and objectively report evaluative information regarding major operations and programs in the district.
3. To design and/or implement valid procedures for assessing student aptitude and achievement.

To achieve these goals a variety of studies are to be prepared. These studies, both short term and longitudinal, are described below:

Short Term

- The Criterion-Referenced Testing will involve preparing a report displaying the twenty (20) objectives that received the highest rating for each subject area at each grade level.
- The School Profiles will provide information on academic and demographic characteristics of both students and teachers in each of the district's schools and the vocational and/or educational pursuits of students one year after graduation from the high schools of the district.
- "School Measurement Profiles" will be prepared annually, one for each grade, displaying by sex and ethnic group, the means and standard deviations for each of the six major standardized testing batteries administered in the district.
- "Teacher Profiles" will provide academic and demographic characteristics of teachers. A "Teacher Profile" will be prepared for each school level (elementary, junior high, secondary).

- "Additional Academic and Demographic Characteristics" will provide the district with other information not provided in other profiles. All information is presented by school, including the proportion of pupils (by ethnic group, sex, and grade level) above age in grade; pupil absences by grade level, sex, and ethnic group; courses taken and grades received (in the same groupings as above); the proportion of dropouts; the participation in extra-curricular activities, and one year follow-up data.

Long Term Research and Evaluation

These activities have to do with an examination of those questions concerning long-term trends or prediction problems which will require that observations be made over a period of time comparable to the interval over which the prediction is desired or the trends are to be analyzed.

- "School Profile" as discussed in the previous section, will be analyzed on a longitudinal basis providing annual and cumulative statistics.

- "Profile Trend Studies" will provide insight into such considerations as the change (or lack thereof) in the academic and demographic characteristics of students and teachers over time and the analysis of whether this change is systematic and whether there are parallel trends in other variables.

- "Dropout Studies" will be conducted to determine whether it is possible to formulate reasonable accurate predictions of student dropout.

- "Teacher Student Characteristics Studies" will be conducted to ascertain whether schools vary in terms of student achievement levels beyond obvious factors of different aptitude and achievement levels at entrance; to analyze whether teachers differ with respect to the gain and achievement exhibited by their students, and to define that configuration of teacher and student characteristics which seems to provide maximal or minimal output in terms of student achievement.

- "Measurement Studies" will be conducted on a longitudinal basis, to determine the extent to which students maintain their standing, relative to others of the same grade, on aptitude and achievement tests from year to year and to evaluate the reliability of DISD administered standardized, criterion and special tests.

- "Follow-up Studies" will be developed to reveal any shift over time in the vocations adopted by former DISD students and in the percentage who enroll in colleges; describe the characteristics of students who graduate from colleges, junior colleges, and business schools as contrasted with those who enter such institutions but do not graduate; and to determine the proportion of DISD students selecting vocational programs who later earn their living in the same or a related field.

- "Grading and Reporting Studies" will be conducted to determine in the relationship between grades, and achievement and aptitude both in a given school and across schools.

- "Population Projection Studies" will be implemented to predict the school population by geographic area and grade; to predict the ethnic composition of each geographic area by grade; to predict the frequency of DISD graduates who will enter college or business school or the labor market in future years; and to predict the extent of the need for professional educators in DISD as well as the distribution of demographic characteristics of educators.

At the present time PMIS is not generating these studies. Much of the data they require is not available. In addition the department has requested that they write the necessary report programs. However, the R & E staff has not as yet been thoroughly trained in PMIS technology. PMIS will be generating these studies when these two roadblocks are overcome.

4.5 FEDERAL, STATE AND LOCAL REPORTING SUBSYSTEM

It has always been the intent of PMIS to generate planning and evaluation oriented reports for either intra-district use, or for submission to state and Federal agencies. The problem has been in deciding what priority to place on constructing a library or report programs, and in selecting which reports should be generated. By joint agreement between CGCS and DISD, it was decided that this subsystem would take the lowest development priority. This would allow time to plan for the move away from a fixed reporting operation to a more

flexible and selective reporting process. The selection of actual reports occurred as follows:

- Federal Reports - the system was designed to support the Belmont reports provided the data was available. However, when the Belmont effort was redirected, work stopped on developing the Belmont related modules.

- State Reports - a straightforward review of reports submitted to Texas Education Agency was performed, and from this review appropriate reports were included in this subsystem.

- Local Reports - Any reports used in the local district and not included in either the strategic planning models or the R & E reports was identified as a needed local report.

The number of reports to be produced by this subsystem has been steadily trimmed. A large reduction was accomplished when the reports called for in the Detail Design Report were consolidated into twenty-six larger reports. Then, the data analysis revealed that complete, accurate, and timely data existed for only thirteen of these reports. These "reports", or more accurately, report modules, will be the nucleus for this subsystem. As more data become available, and as users convert ad hoc reports to standard reports, this subsystem will grow in size.

Products

The following is a brief description of the thirteen reports in this subsystem.

- Annual Assessment: Student Performance.....SR-100
  This report displays for each grade within each school the total number of students within each ethnic group, giving the achievement levels (language, math, science, social studies, music/art) and the retention rate for each ethnic group for both the current and the previous year. School totals are given for the above. Additionally, student counts and costs are given, by program, for special projects within each school (including school totals for special projects). District-wide totals are given for all of the above information (ethnic, achievement, retention rate for previous and current year as well as special program student counts and costs).

- Teacher Stability--Student Performance.....SR-103
  This report gives, by school, the percent of teachers who have taught the same course for one year, two years, three years, four years, five-ten years, and ten-plus years. Also showing the average years per course. The report also displays, by school, the student performance for the current year including language achievement, math achievement, science achievement, social studies achievement, music percent participation, and retention rate. School area totals and district-wide totals are also given. This report allows the analysis of the effectiveness of experience in a given subject as a factor of student performance.

- Student/Teacher Ethnic Distributions.....SR-104
  This report displays, by section within school, the teacher's sex, ethnic group, and years of experience. Also displayed by section are the number of males and females within each ethnic group as well as the percent of the total students within each section falling in each ethnic group. School totals and district-wide totals are also given.

- Campus Program Costs and Student Characteristics.....SR-110
  This report displays the major assignment and cost for each program within each school giving for each program the number of students by sex within each ethnic group. Totals are given by major assignment, by program, and by school.

- Superintendent's Annual Report of Student Population..SR-111
  This report displays for each grade within each school the total number of students by sex within each ethnic group. School totals are given.

- Student Membership Summary by Sch. 'Grade.....SR-112
  This report gives for each grade wit each school information about each ethnic group pertaining to the number of students by sex, the original enrollment, the enrollment during the year, the losses, the total end-year enrollment, the aggregate attendance, absence, the daily membership, the average membership, the average daily membership, the average ineligible ADA, the refined ADA, and the attendance percentage.

- Elementary Student Retention Summary.....SR-114
  This report gives district-wide summaries of students retained for grades 1 through 9 and a district-wide elementary student retained total.

- Non-Certified Personnel Summary.....SR-115
  This report gives the total number of full-time and part-time employees by job code.

- Driver Education Enrollment Summary.....SR-117
  This report gives, for each teacher within each school, the total number of students by sex and target group within each ethnic group participating in the driver education program. Totals are given by ethnic group and by school.

- Work Study Student Report.....SR-119
  This report displays detailed information about each student within each course within each school, including the student name, his sex, his date of birth, his work study occupation code, and the employer.

- Student Ethnic Distribution by Course.....SR-200
  This report displays, on a semester basis, for each school the total number of students in each ethnic group for each program.

- Student Ethnic Distribution by Section.....SR-201
  This report displays, on a semester basis, the program name and instructor name, followed by the total number of students in each ethnic group.

- Multi-Analytic Student/Staff Characteristics.....SR-202
  This report displays for each school, its administrative area, its grade span, and the total number of students. Additionally, the following information is displayed: 1) the total number of certified classroom teachers, 2) the ratio of pupils to classroom teaching units, 3) the ratio of pupils to classroom teaching units plus librarians, 4) the total number of other certified support personnel, 5) the ratio of pupils to other certified personnel, 6) the total number of non-certified personnel, 7) the ratio of pupils to non-certified personnel, 8) the total professional personnel, 9) the ratio of pupils to all certified personnel, 10) the total adult personnel, 11) the ratio of pupils to all adult personnel.

4.6 SUPPORT SYSTEM SUMMARY

PMIS is an extremely versatile tool. The models, reports, and ad hoc query capability can be used singly, or in combination, for a wide variety of uses. Basically the R & E reports, local reports, and ad hoc query capability are used to perform evaluations and need assessments, and to describe resource availability. The models are used for resource allocation and manpower prediction. The four processes--evaluation, needs assessment, resource availability, and resource allocation, are used in the following management functions.

Instructional Services Planning (program and project)

Staff

- Planning
- Placement
- Training
- Evaluation

Facilities Planning

Student Services Planning (including medical, food and instructional support)

Test Analysis

Summary Program or Project Evaluation

Salary Policy Formation

Salary Negotiation

Community Relations Reporting

Fund Acquisition Filing

The actual description of the use of PMIS is a report in and of itself, and the designers perception of how PMIS can be used will undoubtedly be altered by the actual use of PMIS over the upcoming years. Therefore, this description is not included in this report.

Chapter 5

SYSTEM OPERATIONS

5.1 GENERAL CONSIDERATIONS

PMIS is primarily a philosophy of management information system development. Its premise is that a MIS system can be developed that extracts data from a district's operational systems, stores this data in a large data base, and subsequently uses models, reports and queries to convert this data into useful management information. There is wide latitude in how the district implements such a system. While Council believes that the approach used during the pilot effort is the best route to take, it realizes that circumstances in a district could force changes in certain aspects of the system's implementation. Such changes could significantly alter many operational aspects of PMIS. For this reason it is very difficult to provide definitive statements of hardware, software, personnel and operational requirements. All that is possible is to give the reader an appreciation of the major factors that influence system operation.

In discussing PMIS the use of certain assumptions helps clarify and simplify the technical discussion.

1. SYSTEM 2000 will be the PMIS data management system.
2. The system will be run on the district's own equipment.
3. The structure and content of the data base will be essentially identical to the pilot system.

Any changes to these assumptions can significantly change the system's operational considerations. If a different data management system is used the system will most likely lose some of its flexibility,

will require more manpower for query and report preparation, but will require less storage and run time. If time is purchased from outside vendors, communication line charges and disc usage become important factors. If large parts of the data base are deleted, or if additional trees are added to the data base, run and storage costs could change significantly.

5.2 HARDWARE/SOFTWARE REQUIREMENTS

Minimum hardware and related software requirements are shown in Table 5.1. It should be noted that the crucial piece of software, SYSTEM 2000, dictates what computer models the system can be run on, and what memory size and operating systems must be available.

The minimum disc and tape requirements shown in Table 5.1 are based on the following assumptions:

- Student Support is disc resident
- Student I and II are tape resident
- At the current time these data bases must be disc resident, but in the near future SYSTEM 2000 will have a new feature that permits tape resident data bases.
- SYSTEM 2000 work files are small and require insignificant disc storage.

The disc storage minimum requirements are based on a district one half as small as DISD, that is one containing approximately 80,000 students. PMIS can be of definite use to districts having less than 80,000 students, but Council's primary concern is with districts at least this large.

The only additional software required over and above SYSTEM 2000 and the computer's operating system is COBOL and FORTRAN. COBOL

MINIMUM SYSTEM REQUIREMENTS

Hardware	Manufacturer		
	IBM	UNIVAC	CDC
Model	360/50, 370/145 or larger	1100 series	6000 series
Memory	256K under OS	28K decimal words	18K decimal words
Operating Systems	OS	EXEC 8	SCOPE KRONOS
Disc Storage	25 Million Char.	25 Million Char.	25 Million Char.
Tape drives	2	2	2

TABLE 5.1

is used for programming large data acquisition and standard report modules. Planning models are written in FORTRAN. SYSTEM 2000 contains a feature called Procedural Language Interface that allows both COBOL and FORTRAN programs to directly transfer data in and out of the data base. Table 5.2 indicates which versions of these compilers can use the Procedural Language Interface feature.

	COBOL	FORTRAN
IBM	ANS, Level F	FORTRAN G, H
UNIVAC	ANS, Standard	FORTRAN 5
CDC	6000 Version	Under KRONOS Run FTN Under SCOPE Run 23

TABLE 5.2

Maximum memory and disc storage requirements depend on the size of the district and the PMIS operating environment. The number of students, staff members, facilities and programs in the district largely determine disc requirements. The extent to which the data base is inverted i.e., organized for rapid retrieval, also affects disc storage requirements. Memory requirements may increase if special telecommunication software is needed to handle large numbers of terminals, or if large planning models are to be run. The only accurate way to determine total memory and disc storage requirements is to perform a detailed analysis of each district's situation.

5.3 PERSONNEL REQUIREMENTS

A minimum of two full time programmer/analysts are needed for data base administration and user interface/training. Additional

personnel can be used for development of complicated planning models and standard report programming. Also during PMIS implementation the gaps or deficiency in the district's data collection systems are invariably pointed out. Additional design personnel can be used for developing the information systems needed to close these gaps. And finally, the use of PMIS is governed by how well managers understand PMIS' capability, how well they associate these capabilities with their needs, and how comfortable they are in using PMIS. The more personnel assigned to user interface/training the greater the usage of the system. In the final analysis, the district must decide what level of resource over and above the minimum requirements stated above will be assigned to PMIS development and implementation.

5.4 PILOT SYSTEM OPERATING ENVIRONMENT

The pilot system has been developed for the Dallas Independent School District. However the regional computer center that services DISD was unable to take on PMIS. Therefore, DISD purchased CDC 6600 computer time from the Texas Education Agency's Regional Service Center located in Houston, Texas. A remote job entry (RJE) terminal consisting of a card reader, card punch, teletype and line printer is the primary input/output device to the Houston center. The RJE terminal is located in the DISD central office building. Three teletype terminals, for ad hoc query use, are on order and will be installed in the building.

PMIS uses a maximum of 120,000 words (octal) of memory for any one run. It requires 160 million characters of disc storage for the entire data base. One hundred and ten million characters

of this storage is for STUDENT I and II; these data bases will be moved to tape as soon as a new SYSTEM 2000 feature is implemented.

Two full time professionals perform data base administration and user interface/training. Funds permitting, a full time analyst/programmer will also be assigned to the PMIS team to expand the Data Base Maintenance subsystem. These resources will hopefully be augmented by Council resources.

The staff discussed above is part of the Data Processing Services Department. The Department is responsible for most PMIS development and operations. In certain areas, such as development of planning models and research and evaluation reports, development is performed by other organizations. For example DISD has just received USOE funds for its SIMU-SCHOOL Project. This project will focus its efforts upon the development of five products: 1) a comprehensive school planning model based upon a study which details the global aspects of the educational planning process; 2) a teacher requirements simulation model which will predict the number and cost of teachers by school; 3) a computerized recipe file and menu-planning capability which also provides nutritional analyses; 4) a computer-based model which will order and inventory food; and 5) a mathematical model which will select optimum site locations for new facilities. These models will receive most of their data from PMIS. Development of these models will require seven full time professionals; these people, however, will not be considered as PMIS staff members.

5.5 PMIS FIRST YEAR COST

In total DISD has budgeted $119,000 for the first year of PMIS operations. Of this amount $60,000 has been allocated for the purchase of computer time from the regional service center. It is planned that the computer time will be split equally between data base maintenance and information retrieval (model, report and ad-hoc query execution). The use of an off-site computer center entails rental of a remote job entry terminal and a leased communication line; the total cost of these two items is $14,600. Also included in the first year budget is a one time charge of $8,000 for purchase of six low speed terminals. The remainder of the PMIS budget consists of $31,500 for personnel salaries and $4,900 of other miscellaneous costs.

There is some uncertainty in the PMIS budget regarding the cost of computer time. The budget is currently based on the purchase of 240 hours of computer time (at $250 per CPU hour). It is quite conceivable that this total amount of time will not be required either because data base maintenance programs are optimized or because user requests are lower than anticipated. On the other hand the budget could be exceeded if users place heavy demands on the system. This would be a delightful situation for it would mean that PMIS would be fulfilling its role -- supply information to DISD managers.

Chapter 6

FUTURE PMIS ACTIVITIES

6.1 GENERAL

Since the PMIS project is a pilot effort it is hoped that work will not end when the pilot system becomes operational. A system of PMIS' magnitude has a significant impact on a district's management process. It will require as much as ten years before the full impact of the system is known at a site. And since the system is to be made available to many districts, new PMIS developmental efforts hopefully will spring up.

6.2 CONTINUED WORK AT THE PILOT SITE

Continued work at DISD falls into two catagories--system enhancement and user training. The system can be immediately enhanced by closing the data gap. At this time there are more than 170 data elements that are needed for planning and decision making which are unavailable. The pilot site has embarked on a program to gather this data. The development of additional planning models would also enhance the system. The three models presently included in PMIS represent the start of a library of forecasting and simulation tools needed by educational planners. A secondary enhancement will be an increase in the reports library. However, since this type of enhancement is an outgrowth of system use, it does not require a formal development process.

Of equal, or possibly greater importance than system enhancement, is user training. This represents a multi-year effort. Basically

PMIS is a tool. Users must be trained to become "craftsmen" in using the tool. For this to occur the users must be oriented to the new way of doing things. While there is a number of ways of accomplishing this, the preferred approach is to place trained PMIS "interns" in the user organization. So situated, the interns can spot problems to which PMIS can be applied. Also they can help the user formulate his information requests and can work with the PMIS staff to insure that PMIS supplies the needed information. Regardless of the training approach used, it will still take time and effort to train users until they become completely comfortable in using this new and powerful tool.

6.3 PMIS PROLIFERATION

One of the goals of the PMIS project was to make PMIS available to other districts once it had been successfully installed in the pilot district. Obviously, some system modifications will be needed in order to tailor the pilot system to a new environment. Under the assumption that a district has on-site, or has access to, an IBM, UNIVAC, or a Control Data Computer (20 of the Council's districts meet this assumption), the following is a brief discussion of system modification that would be required.

	Modification
. SYSTEM-WIDE	
Data Base	No significant effort required.
SYSTEM 2000	No significant effort required.
. PMIS/SS	
Data Acquisition	Modules must be rewritten since every district has different operational systems from which data must be extracted.

	Modification
. PMIS/SS	
Internal Control	No significant effort required.
Other Software Languages	No significant effort required.
. PMIS/IS	
Strategic Planning	The two current models are fairly general in their approach and can probably be used with little redesign effort.
Research & Evaluation	DISD's R & E effort is more advanced than most Council districts. Their project and longitudinal studies will most likely be acceptable to other districts, in which case little redesign effort will be required.
Federal, State & Local Reports	Federal reports modules should not require any change. Significant changes may have to be made to the local and state reports modules, and additional reports may be required.
Top Management Ad Hoc	No significant work required.

The Council believes that any district contemplating PMIS implementation should first conduct a requirements analysis to determine what changes must be made to each of the subsystems. Only in this way can the magnitude of the design and implementation effort be fully assessed.

6.4 SUMMARY OF PMIS' FUTURE

By June 30, 1973 it is anticipated that the pilot system will be operational in DISD. DISD has also committed itself to start closing the data gap; clearly this will take a number of years. As for further enhancements, this largely depends on outside funding since DISD, like most Council districts, has limited funds for developmental

work.

The future of PMIS proliferation is also dependent of funding. DISD is relatively secure financially when compared to most Council districts. Most districts have serious financial problems, and without outside help many districts will be unable to muster the resources needed for developmental activities. Council is exploring federal funding possibilities but the situation appears bleak. Thus the future of PMIS rests largely on Council's success in securing funding from other sources, or in the districts' abilities to fund the proliferation effort themselves.